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Athlete Imagery Ability: A Predictor of Confidence and Anxiety Intensity and Direction

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Abstract

This study investigated whether athletes' sport imagery ability predicted the intensity and direction of their trait-anxiety, and whether trait-confidence mediated this relationship. Three-hundred and fifteen male (*n* = 181) and female (*n* = 134) athletes (M_{age} = 19.23; *SD* = 1.16) completed the Sport Imagery Ability Questionnaire to measure skill, strategy, goal, affect, and mastery ease of imaging, and the Competitive Trait Anxiety Inventory-2 to measure the intensity and direction of cognitive and somatic anxiety and self-confidence. Structural equation modeling supported a model whereby mastery and goal imagery ability positively predicted confidence. This in turn negatively predicted cognitive and somatic anxiety intensity and positively predicted cognitive and somatic anxiety direction. Mastery and goal imagery ability indirectly predicted cognitive and somatic anxiety intensity and direction via self-confidence. However, mastery ease of imaging directly predicted cognitive anxiety intensity. Results demonstrate the importance of mastery and goal imagery ability in regulating confidence and the intensity and direction of anxiety symptoms. Results infer that individuals who are better at seeing themselves achieving goals and performing well in difficult situations are able to reduce the impact of negative images by replacing these with positive ones.

Key words: cognitive anxiety, confidence, ease of imaging, somatic anxiety

Athlete Imagery Ability: A Predictor of Confidence and Anxiety Intensity and Direction

Numerous studies demonstrate that higher confidence is associated with greater sporting success (for review see Vealey & Chase, 2008). Although the relationship between performance and anxiety is less understood, anxiety can still greatly impact upon sport performance. While some studies show higher levels of anxiety are associated with disruptions to performance and choking under pressure, others suggest that the interpretation of anxiety symptoms could be a stronger predictor of subsequent performance (for review see Hanton, Neil, & Mellalieu, 2008). Consequently, techniques have been developed to help increase confidence and regulate arousal and anxiety to help athletes reach optimal performance.

One frequently used technique is imagery. It is well-established that athletes who display higher levels of self-confidence image more often (e.g., Abma, Fry, Li, & Relyea, 2002; Beauchamp, Bray, & Albinson, 2002; Callow & Hardy, 2001; Moritz, Hall, Martin, & Vadocz, 1996; Vadocz, Hall, & Moritz, 1997). Guided imagery can effectively increase self-confidence by acting as a source of performance accomplishment (e.g., Callow & Waters, 2005; Cumming, Olphin, & Law, 2007; Short et al., 2002; Williams & Cumming, 2012b; Williams, Cumming, & Balanos, 2010). That is, based on Bandura's social cognitive theory (1977, 1997), imaging oneself performing skills and strategies well, or achieving goals, will increase beliefs in one's own capabilities by giving an athlete a sense that they have been successful.

Imagery can also regulate anxiety by reducing the intensity of symptoms experienced and/or by helping athletes to view these symptoms as under control (e.g., Cumming et al., 2007; Hale & Whitehouse, 1998; Mellalieu, Hanton, & Thomas, 2009). Imagery can enable athletes to reappraise their anxiety symptoms as more facilitative towards performance either directly, or indirectly, by inferring higher levels of confidence (e.g., Cumming et al., 2007; Hanton & Jones, 1999b; Hanton, Mellalieu, & Hall, 2004; Thomas, Maynard, & Hanton, 2007; Williams et al., 2010). Imagery scripts containing descriptions of anxiety symptoms with feelings of confidence and positive cognitions of being in control of the situation (i.e., coping imagery) elicit anxiety symptoms as more helpful towards an upcoming competitive performance (Cumming et al., 2007; Williams et al., 2010).

The mechanism by which these changes occur was proposed by Hanton et al. (2004) who suggested that higher levels of self-confidence enable athletes to maintain a positive outlook with regards to competition. By modifying thoughts and feelings, self-confidence can lead to more facilitative interpretations of anxiety symptoms (see also Jones & Hanton, 2001). In other words, confidence may mediate the relationship between imagery use and anxiety symptoms. In support, elite athletes have reported deliberately using confidence-enhancing strategies such as imagery to reduce debilitative symptoms of anxiety (Hanton et al., 2004). The findings from Hanton et al.'s (2004) study also emphasize that anxiety direction may be more influential on performance outcomes than anxiety intensity (see also Hanton & Jones, 1999a; Neil, Wilson, Mellalieu, Hanton, & Taylor, 2012).

While a relationship between confidence, anxiety and imagery use is well-established, this relationship has not yet been extended to imagery ability. Imagery ability can be defined as "an individual's capability to form vivid, controllable images and retain them for sufficient time to effect the desired imagery rehearsal" (Morris, Spittle, & Watt, 2005, p. 37). Consequently, one's ability to image is reflected through various dimensions such as vividness, controllability, and ease. Emotion is another construct sometimes assessed as it is thought that an emotive image is likely to be more vivid (Lang, Kozak, Miller, Levin, & McLean, 1980). Vividness is the "clarity and 'sharpness' or sensory richness" of an image, whereas controllability refers to the "ease and accuracy with which an image can be transformed or manipulated in one's mind" (Moran, 1993; p. 158). Conversely, ease of imaging is the amount of effort required to create and control an image (Cumming & Williams, 2012). While it has been suggested that vividness relates to imagery generation and control refers to its manipulation, ease of imaging reflects these different aspects of the imagery processes (Williams & Cumming, 2011).

From an applied perspective, it is important to consider the relationship between imagery ability and confidence and anxiety. Because, a person's capacity to image can determine the effectiveness of imagery use (Cumming & Williams, 2012; Robin et al., 2007). Individuals with higher imagery ability experience more benefits from imaging compared to their lower level counterparts (e.g., Gregg, Hall, & Nederhof, 2005; Robin et al., 2007; Williams, Cooley, & Cumming, 2013). Imagery ability can also directly predict tendencies such as challenge and threat appraisals, confidence, and anxiety intensity (e.g., Williams & Cumming, 2012c; Abma et al., 2002; Vadocz et al., 1997). However, the exact nature of these relationships has varied. In some research, athletes displaying higher levels of confidence have been found to report greater imagery ability than those with lower confidence (Barr & Hall, 1992; Moritz et al., 1996). Other studies have demonstrated no differences in imagery ability between high and low confident athlete groups (see Abma et al., 2002; Vadocz et al., 1997). Similarly, the relationship between imagery ability and anxiety intensity has not been consistent between studies (see Vadocz et al., 1997; Monsma & Overby, 2004), and to our knowledge the relationship between imagery ability and the interpretation of anxiety symptoms has not yet been investigated.

The measure of imagery ability used within previously conducted studies examining the relationship between imagery ability, and confidence and anxiety may partly explain why results have been inconsistent. Participants' ability to image simple movements were measured despite there being a much wider range of imagery content employed by athletes (Williams & Cumming, 2012c). Athletes report imaging themselves performing skills and strategies, achieving goals and outcomes, experiencing feelings and emotions associated with performance (i.e., affect imagery), and positive cognitions while performing well in difficult situations (i.e., mastery imagery) (Cumming & Williams, 2011). As imagery ability varies with the content imaged (Williams & Cumming, 2011), measuring athletes' ability to image simple movements provides a limited explanation of their confidence and anxiety responses to competition. It is likely that the ability to image sport content would be even more informative. By employing a measure assessing different sport specific imagery content, the relationship between imagery ability, confidence, and anxiety can now be more comprehensively investigated.

Based on Bandura's social cognitive theory (1977, 1997), researchers have suggested that if an athlete images himself/herself successfully performing skills and strategies, or mastering difficult situations, these images are likely to serve as a stronger source of confidence by acting as a performance accomplishment (e.g., Callow & Hardy, 2001; Callow & Waters, 2005). Williams and Cumming (2012c) argue that if an athlete has a greater capacity to image this content (i.e., greater skill, strategy, goal, and mastery imagery ability), it may act as a stronger source of confidence. Although athletes can use a variety of imagery content to enhance confidence and regulate anxiety (Cumming & Williams, 2012), the use of mastery-type images has shown the strongest link to confidence (e.g., Callow, Hardy & Hall, 1998; Vadocz et al., 1997). Similarly, the use of arousal-type images often has the strongest link to anxiety (e.g., Vadocz et al., 1997; Monsma & Overby, 2004). Imagery content emphasizing positive feelings and emotions has also been used by researchers to regulate anxiety and enhance confidence (e.g., Cumming et al., 2007; Hale & Whitehouse, 1998; Williams et al., 2010; Williams & Cumming, 2012b). It is likely that a similar relationship may exist between imagery ability, and confidence and anxiety; that is, an athlete's ability to image positive mastery (e.g., performing well under pressure) and affect (e.g., the feelings associated with a successful performance) imagery content may also have the strongest links to confidence and anxiety levels respectively.

With this is mind the purpose of the present study was designed to test a model examining the relationship between sport imagery ability, trait-confidence, and cognitive and somatic anxiety intensity and direction. To gain greater insight into the direct influence that imagery ability has on an athlete's trait-confidence, the study re-examined the relationship between SIAQ images and confidence. A second aim was to investigate whether affect and mastery imagery ability directly predict cognitive and somatic anxiety intensity and direction, and whether this relationship is mediated through trait-confidence – a possibility which has yet to be investigated in the literature.

Drawing from social cognitive theory, it was hypothesized that by serving as a source of performance accomplishment, greater imagery ability as measured by the SIAQ, regardless of imagery content, would positively predict trait-confidence. However, the ability to image mastery content was expected to be the strongest predictor. It was also hypothesized that trait-confidence would mediate the relationship between ease of imaging and cognitive and somatic anxiety intensity and direction by negatively predicting anxiety intensity and positively predicting anxiety direction. In addition to mediation, it was predicted that affect and mastery imagery ability would negatively predict cognitive and somatic anxiety intensity but positively predict their direction. The hypothesized model can be seen in Figure 1.

Method

Participants

Three hundred and fifteen male (*n* = 181) and female (*n* = 134) athletes took part in the study. Participants had a mean age of 19.23 (*SD* = 1.16) years and represented a total of 39 different team (*n* = 192) and individual (*n* = 123) sports. The largest sport cohorts represented were soccer (*n* = 80), rugby (*n* = 33), long distance running (*n* = 21), field hockey (*n* = 20), and athletics (*n* = 19). Athletes participated in a variety of competitive levels including recreational (*n* = 73), club (*n* = 128), county (*n* = 62), regional (*n* = 9), and elite (*n* = 43), and had taken part in their chosen sport for an average of 7.73 years (*SD* = 4.10).

Measures

Demographic Information. Participants provided details of their age, gender, sport played, competitive level, and years of playing experience.

Sport Imagery Ability. Participants completed the 15-item SIAQ (Williams & Cumming, 2011) to assess their ease of imaging sport specific cognitive and motivational imagery content. Five subscales, each composed of 3 items, represent skill images (e.g., making corrections to physical skills), strategy images (e.g., creating a new game/event plan), goal images (e.g., myself winning a medal), affect images (e.g., the anticipation and excitement associated with my sport), and mastery images (e.g., remaining confident in a difficult situation). Participants rate the ease with which they are able to generate each image on a 7-point Likert type scale ranging from 1 *(very hard to image)* to 7 *(very easy to image)*. An average score is then calculated for each type of imagery. The SIAQ has been identified as a valid and reliable measure of imagery ability with good psychometric properties (Williams & Cumming, 2011). The SIAQ demonstrated adequate internal reliability with Cronbach alpha coefficient values all above .70 (Hair, Anderson, Tatham, & Black, 1998) for skill (.79), strategy (.85), goal (.81), affect (.76), and mastery (.80) images.

Trait Anxiety and Confidence. The Competitive Trait Anxiety Inventory-2 (CTAI-2; Albrecht & Feltz, 1987) was employed to assess trait cognitive and somatic anxiety, and self-confidence intensity and direction. This is a 27-item questionnaire assessing how cognitively anxious (e.g., I am concerned about performing poorly), somatically anxious (e.g., my body feels tense), and self-confident (e.g., I'm confident about performing well) athletes generally feel when competing in their sport. For each item, the individual rates the intensity with which they usually experience the thought or feeling on a 4-point Likert type scale ranging from 1 (*not at all*) to 4 (*very much so*). Using a 7-point Likert type scale ranging from -3 (*very negative/debilitative*) to +3 (*very positive/facilitative*), the individual next rates whether this feeling is generally positive or negative towards their performance. The CTAI-2 has been identified as a reliable measure of self-confidence and anxiety intensity and direction (e.g., Mellalieu, Hanton, & O'Brien, 2004). For the purpose of the study, the self-confidence direction subscale was not completed by participants. In the present study, the CTAI-2 demonstrated adequate internal reliability with Cronbach alpha coefficients above.70 for cognitive intensity (.85), cognitive direction (.82), somatic intensity (.86), somatic direction (.74), and self-confidence intensity (.88).

Procedures

Following ethical approval from the University where the authors are based, participants were recruited either through their involvement in local sports teams or by taking an undergraduate sport psychology class. Those participating in the class were awarded with a course credit. All participants were given an information sheet explaining the study and had the opportunity to ask further questions. Those agreeing to take part completed a consent form on the understanding that their participation was voluntary and they were free to withdraw at any time. Participants then provided their demographic information and completed the SIAQ and CTAI-2, which took less than 20 minutes. After completing the study, participants returned the questionnaires to the researcher and participants were thanked for their participation.

Data Analyses

Data was analyzed using SEM with maximum likelihood estimations using the computer package AMOS 16.0 (Arbuckle, 2007). The two-step approach was followed whereby the factor structure of each questionnaire was first examined before investigating the structural model (Kline, 2005). Although each model's overall goodness of fit was tested using the chi-squared likelihood statistic ratio (χ^2; Jöreskog & Sörbom, 1993), a nonsignificant value is rarely obtained in practice. Therefore we employed additional fit indices based on Hu and Bentler's recommendations (1999). First, the standardized root mean square residual (SRMR; Bentler, 1995) and Root Mean Square Error of Approximation (RMSEA) were employed as indicators of absolute fit reflected in values of ≤ .08 and .06 respectively representing an adequate fit (Hu & Bentler, 1999). Secondly, the Tucker Lewis Index (TLI) and Comparative Fit Index (CFI) were selected to reflect incremental fit with values > .90 and > .95 indicating an adequate and excellent model fit respectively (Hu & Bentler, 1999). It is important to note that although there is some debate regarding how appropriate these values are at demonstrating appropriate model fit (see Markland, 2007; Marsh, Hau, & Wen, 2004), these criteria are still the most commonly reported as indications of an adequate model fit and are subsequently followed here.

Any questionnaires demonstrating a poor factor structure underwent the removal of problematic items in a step-by-step process to improve the model fit by inspection of the modification indices. This approach is justified as resultant models are derived from the best-performing indicators without sacrificing the hypothesized model structure (Hofmann, 1995).

Once all questionnaires demonstrated an adequate model fit, a process to improve the variable to sample size ratio and increase the stability of the estimates was undertaken. This involved constructing specific parcels for remaining items on the CTAI-2 subscales (Little, Cunningham, Shahar, & Widaman, 2002). In a similar manner to Williams and Cumming (2012c), an item-to-construct balance approach was taken whereby the item with the highest factor loading was parceled with the item with the lowest factor loading from the same subscale. The item with the second highest loading was then paired with the item displaying the second lowest loading until all items were assigned to a two-item parcel (Little et al., 2002). The measurement model as a whole was then investigated and Mardia's coefficient was examined to determine whether data displayed multivariate normality.

Mediation analysis was conducted following Hayes (2013) recommendation of testing for indirect effects. This involved testing the indirect effects of the SIAQ subscales that predicted confidence (i.e., the mediator) to examine whether they indirectly predicted cognitive and somatic anxiety intensity and direction via self-confidence. Bootstrapping of 2000 samples was used to generate 90% confidence intervals. Standardized regressions and 90% confidence intervals were reported for all significant indirect effects.

Results

Descriptive Characteristics

Means and standard deviations for the SIAQ and CTAI-2 were calculated and are presented in Table 1. SIAQ subscale means ranged from 4.76 to 5.70. CTAI-2 mean scores ranged from 2.16 to 2.50 for intensity and from -0.50 to 0.05 for direction.

Measurement Model

The CFA for the model representing the SIAQ revealed a good fit to the data. However, the poor fit of the CTAI-2 necessitated the systematic removal of three items from the cognitive anxiety subscales, three from the somatic anxiety subscales and one from the confidence subscale before adequate fit to the data was found[1]. After parceling the revised CTAI-2 subscale items, the measurement model as a whole revealed a satisfactory fit to the data, χ^2 (389) = 565.83, p < .001, CFI = .96, TLI = .95, SRMR = .05, RMSEA = .04 (90% CI = 0.03 - 0.05). Inspection of the Mardia's coefficient revealed data did not display multivariate normality (normalized estimate = 20.94). Consequently the bootstrapping technique was employed in all further analysis.

Structural Model

In accordance with our hypotheses, regression paths were drawn from all five types of imagery ability to trait-confidence (Figure 1). Regression paths were also drawn from confidence to cognitive anxiety intensity and direction, and somatic anxiety intensity and direction. Finally direct regression paths were added from both affect and mastery imagery to cognitive anxiety intensity and direction, and somatic anxiety intensity and direction. The structural model demonstrated an adequate fit to the data, χ^2 (407) = 659.84, p < .001, CFI = .94, TLI = .94, SRMR = .06, RMSEA = .04 (90% CI = 0.04 - 0.05). Inspecting the regression weights indicated that the paths to trait-confidence from skill (p = .764), strategy (p = .206), and affect (p = .510) imagery were all nonsignificant and therefore removed from the model. Furthermore the paths from affect imagery to somatic anxiety direction (p = .596), and from mastery imagery to somatic anxiety intensity (p = .128), somatic anxiety direction (p = .348), and cognitive anxiety direction (p = .199) were nonsignificant and also removed from the model.

After making these changes, the second model revealed an almost identical fit, χ^2 (414) = 665.83, p < .001, CFI = .94, TLI = .94, SRMR = .05, RMSEA = .04 (90% CI = 0.04 - 0.06). Inspecting the regression weights indicated that the paths from affect imagery to somatic intensity (p = .079) and cognitive direction (p = .061) were only approaching significance, and were therefore removed from the model. The final model revealed an almost identical fit, χ^2 (416) = 672.52, $p < .001$, CFI = .94, TLI = .94, SRMR = .05, RMSEA = .04 (90% CI = 0.04 - 0.06). This final model is displayed in Figure 2 with standardized regression weights. Results reveal that athletes with greater mastery imagery ability ($\beta = .47$, $p < .001$) and goal imagery ability ($\beta = .23$, $p = .003$) are more self-confident. In turn, greater confidence predicts lower levels of cognitive ($\beta = -.45$, $p < .001$) and somatic ($\beta = -.46$, $p < .001$) anxiety intensity, and facilitative perceptions of these symptoms (cognitive direction: $\beta = .30$, $p < .001$; somatic direction: $\beta = .25$, $p < .001$). Moreover, greater mastery imagery ability directly predicts lower levels of cognitive anxiety intensity ($\beta = -.23$, $p < .025$). Finally, greater affect imagery ability predicts higher levels of cognitive anxiety intensity ($\beta = .17$, $p < .043$). When comparing the first (i.e., hypothesized) model to the final model, the nonsignificant change in χ^2 and the small drop in expected-cross validation index (ECVI) from 3.16 to 3.15 revealed the final model displayed a more parsimonious fit (Byrne, 2010). Therefore, the final model provides the best fit to the data.

Mediation Analysis

To investigate our second hypothesis, we investigated whether trait-confidence mediated the relationship between mastery and goal imagery and cognitive and somatic anxiety intensity and direction by testing for indirect effects (Hayes, 2013). Results from the mediation analysis provided an adequate fit to the data, χ^2 (195) = 464.98, $p < .001$, CFI = .92, TLI = .90, SRMR = .06, RMSEA = .07 (90% CI = 0.06 - 0.07). Although only mastery imagery ability directly predicted all four anxiety subscales (cognitive intensity: $\beta = -.57$, p < .001; cognitive direction: $\beta = .33$, p = .002; somatic intensity: $\beta = -0.24$, p =.021; somatic direction: $\beta = .28$, p < .010), both mastery and goal imagery ability indirectly and significantly predicted all four anxiety subscales. Results of these indirect predictions are displayed in Table 2.

Discussion

The aim of the present study was to examine the relationship between sport imagery ability, trait-confidence, and cognitive and somatic anxiety intensity and direction. It also provided the opportunity to re-investigate whether goal and mastery sport imagery ability are the only predictors of trait-confidence as previously found by Williams and Cumming (2012c). A second aim was to investigate whether imagery ability predicted anxiety directly or through self-confidence; that is, whether confidence mediated this relationship.

Based on the literature (Bandura, 1977, 1997; Callow & Waters, 2005), it was hypothesized that all five types of sport imagery ability would positively predict trait-confidence. Contrary to our hypothesis only goal and mastery imagery ability positively predicted trait-confidence as the pathways from skill, strategy, and affect imagery ability were all nonsignificant. These results are in accordance with previous research which also found only goal and mastery imagery ability to positively predict trait-confidence (Williams & Cumming, 2012c). Together, both studies indicate that athletes generally feel more confident when they are able to more easily image themselves achieving specific goals and outcomes (e.g., winning), and coping and persisting during difficult situations (e.g., staying positive after a setback). This suggests that while imaging skills and strategies may improve athletes' confidence, how well an individual can image these may not be associated with confidence levels.

The present study also examined whether confidence predicted lower anxiety levels as well as more positive interpretations of these symptoms. We also tested whether confidence mediated the relationship between imagery ability and anxiety intensity and direction. In support of our second hypothesis, trait-confidence negatively predicted cognitive and somatic anxiety intensity and positively predicted their directions. Furthermore, it mediated the relationship between mastery and goal imagery ability, and cognitive and somatic anxiety intensity and direction. Findings support the existing anxiety literature which suggests that confidence can lead to more positive interpretations of cognitive and somatic anxiety symptoms (see Hanton et al., 2004; Jones & Hanton, 2001). They also indicate that athletes who are better able to image themselves persisting and overcoming difficult situations and achieving goals, are likely to be protected against higher anxiety levels and negative interpretations of these symptoms through enhancing their confidence. A rugby player interviewed by Mellalieu et al (2009), explained that; "[the imagery] builds your confidence so that you really believe you can do it no matter what you're feeling…the usual worries I get beforehand aren't as destructive, I see them now as helpful as I'm confident I know I can make my kicks even with the pressure." (p. 182). Our findings infer that imagery ability can activate the same kind of mechanism.

In partial support of our final hypothesis, when any indirect effects through self-confidence were accounted for cognitive anxiety intensity was directly negatively and positively predicted by mastery and affect imagery ability respectively. It can be suggested that individuals with poorer mastery imagery ability; 1) may be unable to alter their anxiety intensity and direction though enhancing their confidence using positive images, and/or 2) may also be unable to alter or transform any spontaneous intrusive negative imagery that can result from low confidence (Hanton et al., 2004).

Although affect imagery ability directly predicted cognitive anxiety intensity, the direction of this was opposite to our hypothesis. There was also no significant direct relationship between affect imagery ability and somatic anxiety intensity. Therefore none of our hypotheses regarding affect imagery ability and anxiety intensity were supported. This may be due to affect imagery content reflecting positive feelings and emotions that are not necessarily associated with anxiety. Williams and Cumming (2012c) found that affect imagery ability did not significantly predict a threat state which is associated with negative thoughts and feelings. It could also be suggested that individuals who experience more negative worries and concerns (i.e., cognitive anxiety intensity) are naturally able to generate images associated with feelings and emotions associated with performance more easily as a mechanism to try to deal with these negative thoughts. However, these are suggestions and future research should investigate this more thoroughly, possibly using a qualitative methodology, to understand the relationship in more depth.

To our knowledge, this is the first study to investigate whether imagery ability is able to directly predict anxiety direction. Although imagery ability did not directly predict cognitive and somatic anxiety direction, the mediation analysis infers that higher mastery and goal imagery ability, impacts upon these outcomes indirectly via trait-confidence. Previous research shows mastery imagery use can result in greater levels of confidence and more facilitative interpretations of anxiety symptoms (e.g., Cumming et al., 2007; Hanton & Jones, 1999b; Williams et al., 2010). The present study demonstrates a similar relationship between imagery ability, confidence, and interpretation of anxiety symptoms.

A possible explanation for why skill, strategy, and affect imagery ability did not predict confidence could be due to the dimension of imagery ability assessed. Although the present study assessed ease of imaging, imagery ability can also be reflected in other dimensions and constructs such as vividness, controllability and emotion. A clearer more vivid image may lead to feeling more confident (see Callow, Roberts, & Fawkes, 2006). Alternatively, experiencing more emotions reflective of a positive performance or being able to control these to the appropriate intensity may be associated with higher confidence levels and more positive interpretations of anxiety. Consequently, imagery vividness of skill, strategy, and affect imagery may be a stronger predictor of confidence, and subsequent anxiety intensity and direction. Ease of imagery is known to be highly correlated with other dimensions of imagery ability and has been suggested the most comprehensive dimension of imagery ability (Cumming & Williams 2012: Williams & Cumming, 2011). However, future research should still examine whether certain imagery ability dimensions are stronger predictors of confidence and anxiety.

A limitation of the present study is that it does not consider the individual preferences of anxiety intensity for optimal performance. Lower levels of anxiety do not always elicit a more facilitative interpretation of these symptoms as factors such as sport type and situational importance can play a role (e.g., Hanton, Jones, & Mullen, 2000). It is therefore important for practitioners to not assume that a reduction in anxiety symptoms is appropriate for all athletes and will automatically enable athletes to interpret these as more facilitative. Although confidence was most strongly associated with anxiety intensity, research indicates that anxiety direction is a stronger predictor of performance (e.g., Neil et al., 2012). Performance was not measured in the current study so the relationship between confidence, anxiety intensity and direction, and performance should be examined in future studies to more fully understand the relationship.

Applied Implications and Future Research

Importantly, the findings demonstrate that imagery ability is directly related to trait-confidence and related to anxiety either directly or indirectly via trait-confidence. Findings indicate, as well as implementing imagery interventions to regulate anxiety, imagery ability may be a critical component in regulating anxiety. Training athletes in how to create and control mastery and goal images (i.e., improving their imagery ability), could increase confidence or directly reduce anxiety. Future research should investigate whether techniques such as Layered Stimulus Response Training and observation (Cumming & Williams, 2012), can improve this self-regulation strategy and increase the effectiveness of imagery interventions.

Higher levels of imagery ability are also associated with more frequent imagery use (Gregg, Hall, McGowan, & Hall, 2011; Williams & Cumming, 2012a). Improving athletes' imagery ability may increase trait-confidence and reduce anxiety through using imagery more frequently. It would be interesting to investigate the relationship between imagery ability and confidence and anxiety when accounting for the influence of imagery use through administration of the Sport Imagery Questionnaire (Hall, Mack, Paivio, & Hausenblas, 1998).

Conclusion

In conclusion, results of the present study investigated the relationship between athlete imagery ability, confidence, and cognitive and somatic anxiety intensity and direction. Similar to previous research, results revealed that only mastery and goal imagery ability positively predict trait-confidence which negatively predict cognitive and somatic anxiety intensity and positively predicted cognitive and somatic anxiety direction. Confidence mediated the relationship between mastery and goal imagery ability, and cognitive anxiety direction and between mastery imagery ability and somatic anxiety intensity and direction. Results also revealed that cognitive anxiety intensity was directly predicted negatively by mastery imagery ability and positively by affect imagery ability. Findings contribute to the growing body of literature that demonstrates the relationship between imagery ability and various cognitive, affective, and behavioral outcomes. However, nonsignificant predictions of skill and strategy imagery ability highlight that this relationship is likely to depend on the specific content of the imagery and that researchers should think carefully when selecting a measure to assess imagery ability. Future research should investigate whether these relationships are causal by training imagery ability to see to what extent this alters confidence and anxiety intensity and direction.

Footnotes:

Removed cognitive anxiety items were: “I feel concerned about this competition”, “I have self-doubts”, and “I’m concerned that I won’t be able to concentrate”, Somatic items were “I feel nervous”, “My body feels relaxed”, and “My body feels tight”, and removed confidence item was “I feel at ease”. The removal of these items did not affect the any of the subscales with all Cronbach alpha values still over .70. Specific model fit values for each questionnaire and the order that items were removed can be obtained upon request from the lead author.

References

Abma, C. L., Fry, M. D., Li, Y., & Reylea, G. (2002). Differences in imagery content and imagery ability between high and low confident track and field athletes. *Journal of Applied Sport Psychology, 14*, 67-75.

Albrecht, R. R. & Feltz, D. L. (1987). Generality and specificity of attention related to competitive anxiety and sport performance. *Journal of Sport Psychology, 9*, 231–248.

Arbuckle, J. L. (2007). *AMOS (Version 16.0)*. Chicago: Smallwaters Corporation. [Computer software].

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191-215.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman.

Beauchamp, M. R., Bray, S. R., & Albinson, J. G. (2002). Pre-competition imagery, self-efficacy and performance in collegiate golfers. *Journal of Sports Sciences, 20*, 697-705.

Bentler, P. M. (1995). *EQS structural equations program manual.* Encino, CA: Multivariate Software Inc.

Callow, N. & Hardy, L. (2001). Types of imagery associated with sport confidence in netball players of varying skill levels. *Journal of Applied Sport Psychology, 13,* 1-17

Callow, N., Hardy, L., & Hall, C. (1998). The effect of a motivational-mastery imagery intervention on the sport confidence of three elite badminton players. *Journal of Applied Sport Psychology, 10*, 135S.

Callow, N., Roberts, R., & Fawkes, J. Z. (2006). Effects of dynamic and static imagery on vividness of imagery, skiing performance, and confidence. *Journal of Imagery Research in Sport and Physical Activity, 1*, 1-13.

Callow, N., & Waters, A. (2005). The effect of kinesthetic imagery on the sport confidence of flat-race horse jockeys. *Psychology of Sport and Exercise, 6,* 443-459. doi: 10.1016/j.psychsport.2004.08.001

Cumming, J., Olphin, T., & Law, M. (2007). Self-reported psychological states and physiological responses to different types of motivational general imagery. *Journal of Sport & Exercise Psychology*, *29,* 629-644.

Cumming, J., & Williams, S. E. (2012). The role of imagery in performance. In S. Murphy (Ed), *Handbook of Sport and Performance Psychology*. (p. 213-232). New York, NY: Oxford University Press.

Gregg, M., Hall, C., McGowan, E., & Hall, N. (2011). The relationship between imagery ability and imagery use among athletes. *Journal of Applied Sport Psychology, 23*, 129-141. doi: 10.1080/10413200.2010.544279

Gregg, M., Hall, C., & Nederhof, E. (2005). The imagery ability, imagery use, and performance relationship. *The Sport Psychologist, 19*, 93-99.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis*. Upper Saddle River, NJ: Prentice Hall.

Hale, B. D. & Whitehouse, A. (1998). The effects of imagery manipulated appraisal on intensity and direction of competitive anxiety. *The Sport Psychologist, 12,* 40-51.

Hall, C., Mack, D., Paivio, A., & Hausenblas, H. (1998). Imagery use by athletes: Development of the sport imagery questionnaire. *International Journal of Sport Psychology*, *29,* 73-89.

Hanton, S. & Jones, G. (1999a). The acquisition and development of cognitive skills and strategies. I: Making the butterflies fly in formation. *The Sport Psychologist*, *13*, 1-21.

Hanton, S. & Jones, G. (1999b). The effects of a multimodal intervention program on performance: Training the butterflies to fly in formation. *The Sport Psychologist, 13,* 22-41.

Hanton, S., Jones, G., & Mullen, R. (2000). Intensity and direction of competitive state anxiety as interpreted by rugby players and rifle shooters. *Perceptual Motor Skills, 90,* 513-521.

Hanton, S., Mellalieu, S. D., & Hall, R. (2004). Self-confidence and anxiety interpretation: A qualitative investigation. *Psychology of Sport and Exercise, 5,* 477-495. doi: 10.1016/S1469-0292(03)00040-2

Hanton, S., Neil, R., & Mellalieu, S. D. (2008). Recent developments in competitive anxiety direction and competition stress research. *International Review of Sport and Exercise Psychology, 1,* 45-47. doi: 10.1080/17509840701827445

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis*. New York: The Guilford Press

Hofmann, R. (1995). Establishing factor validity using variable reduction in confirmatory factor analysis. *Educational and Psychological Measurement, 55*, 572-582.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modelling, 6,* 1–55.

Jones, G. & Hanton, S. (2001) Cognitive labeling of precompetitive affective states as a function of directional anxiety interpretations. *Journal of Sports Sciences, 19,* 385-395. doi: 10.1080/026404101300149348

Jöreskog, K. G., & Sörbom, D. (1993). *LISREL 8 user's reference guide*. Chicago: Scientific Software.

Kline, R.B. (2005). *Principles and practice of structural equation modeling.* London; The Guilford Press.

Lang, P. J., Kozak, M. J., Miller, G. A., Levin, D. N., & McLean JR, A. (1980). Emotional imagery: Conceptual structure and pattern of somato-visceral response. *Psychophysiology, 17,* 179-192.

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling, 9*, 151-173. doi: 10.1207/S15328007SEM0902_1

Markland, D. (2007). The golden rule is that there are no golden rules: A commentary on Paul Barrett's recommendations for reporting model fit in structural equation modelling. *Personality and Individual Differences, 42*, 851–858. doi: 10.1016/j.paid.2006.09.023

Marsh, H. W., Hau, K. -T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling, 11*, 320–341. doi: 10.1207/s15328007sem1103_2

Mellalieu, S. D., Hanton, S., & O'Brien, M. (2004). Intensity and direction of competitive anxiety as a function of sport type and experience. *Scandinavian Journal of Medicine and Sciences in Sports, 14*, 326-334. doi: 10.1111/j.1600-0838.2004.00389.x

Mellalieu, S. D., Hanton, S. & Thomas, O. (2009). The effects of motivational general-arousal imagery intervention upon preperformance symptoms in male rugby union players. *Psychology of Sport and Exercise, 10*, 175-185. doi: doi:10.1016/j.psychsport.2008.07.003

Monsma, E. V. & Overby, L. Y. (2004). The relationship between imagery and competitive anxiety in ballet auditions. *Journal of Dance Medicine & Science, 8*, 11-18.

Moran, A. (1993). Conceptual and methodological issues in the measurement of mental imagery skills in athletes. *Journal of Sport Behavior, 16*, 156-170.

Moritz, S., Hall, C., Martin, K., & Vadocz, E. (1996). What are confident athletes imaging? An examination of image content. *The Sport Psychologist, 10*, 171-179.

Morris, T., Spittle, M., & Watt, A. P. (2005). *Imagery in sport*. Champaign, IL: Human Kinetics.

Neil, R., Wilson, K., Mellalieu, S. D., Hanton, S., & Taylor, J. (2012). Competitive anxiety intensity and interpretation: A two-study investigation into their relationship with performance. *International Journal of Sport and Exercise Psychology, 10*, 96-111.

Robin, N., Dominique, L., Toussaint, L., Blandin, Y., Guillot, A., & Le Her, M. (2007). Effect of motor imagery training on service return accuracy in tennis: The role of imagery ability. *International Journal of Sport and Exercise Psychology, 2*, 175-186. doi: 10.1080/1612197X.2007.9671818

Short, S. E., Bruggeman, J. M., Engel, S. G., Marback, T. L., Wang, L. J., Willadsen, A. et al. (2002). The effect of imagery function and imagery direction on self-efficacy and performance on a golf-putting task. *The Sport Psychologist, 16*, 48-67.

Thomas, O., Maynard, I., & Hanton, S. (2007). Intervening with athletes during the time leading up to competition: Theory to practice II. *Journal of Applied Sport Psychology, 19*, 398-418. doi: 10.1080/10413200701599140

Vadocz, E. A., Hall, C. R., & Moritz, S. E. (1997). The relationship between cognitive anxiety and imagery use. *Journal of Applied Sport Psychology, 9,* 241-253.

Vealey, R. S., & Chase, M. A (2008). Self-confidence in sport. In T. Horn (Ed.), *Advances in sport and exercise psychology* (3rd ed., pp. 65-98). Champaign, IL: Human Kinetics.

Williams, S. E., Cooley, S. J., & Cumming, J. (2013). Layered stimulus response training improves motor imagery ability and movement execution. *Journal of Sport & Exercise Psychology, 35,* 60-71.

Williams, S. E. & Cumming, J. (2011). Measuring athlete imagery ability: The Sport Imagery Ability Questionnaire. *Journal of Sport & Exercise Psychology, 33,* 416-440.

Williams, S. E. & Cumming, J. (2012a). Athletes' ease of imaging predicts their imagery ability and observational learning use. *Psychology of Sport and Exercise, 13,* 363-370. doi: 10.1016/j.psychsport.2012.01.010

Williams, S. E. & Cumming, J. (2012b). Challenge vs. Threat: investigating the effect of using imagery to manipulate stress appraisal of a dart throwing task. *Sport & Exercise Psychology Review, 8,* 4-21.

Williams, S. E. & Cumming, J. (2012c). Sport imagery ability predicts trait confidence, and challenge and threat appraisal tendencies. *European Journal of Sport Science. 12,* 499-508. doi: 10.1080/17461391.2011.630102

Williams, S. E., Cumming, J., & Balanos, G. M. (2010). The use of imagery to manipulate challenge and threat appraisal states in athletes. *Journal of Sport & Exercise Psychology, 32,* 339-358.

Table 1.

Means and standard deviations of the SIAQ and CTAI-2 subscales

	Mean (SD)
SIAQ	
Skill Imagery	5.19 (0.87)
Strategy Imagery	4.88 (1.08)
Goal Imagery	4.76 (1.25)
Affect Imagery	5.70 (0.90)
Mastery Imagery	4.80 (1.08)
CTAI-2	
Cognitive Anxiety Intensity	2.35 (0.58)
Somatic Anxiety Intensity	2.16 (0.55)
Self-Confidence	2.50 (0.55)
Cognitive Anxiety Direction	-0.51 (0.90)
Somatic Anxiety Direction	0.05 (0.72)

Note: SIAQ ratings = 1 – 7, CTAI-2 intensity ratings = 1 – 4, direction ratings = -3 - +3.

Table 2.

Indirect effects of mediation analysis

		β	*p*	CI
Goal Imagery				
	Cognitive Intensity	-.15**	.001	-.233 – -.091
	Somatic Intensity	-.13**	.001	-.218 – -.069
	Cognitive Direction	.11**	.001	.055 – .189
	Somatic Direction	.07*	.039	.013 – .142
Mastery Imagery				
	Cognitive Intensity	-.22**	.001	-.317 – -.153
	Somatic Intensity	-.19***	< .001	-.301 – -.119
	Cognitive Direction	.16**	.001	.087 – .250
	Somatic Direction	.10*	.032	.022 – .196

Note: CI = 90% confidence intervals, * $p < .05$, ** $p = .001$, *** $p < .001$.

Figures

Figure 1. Hypothesized model.

Figure 2. Final model predicting trait-confidence, and cognitive and somatic anxiety intensity and direction.

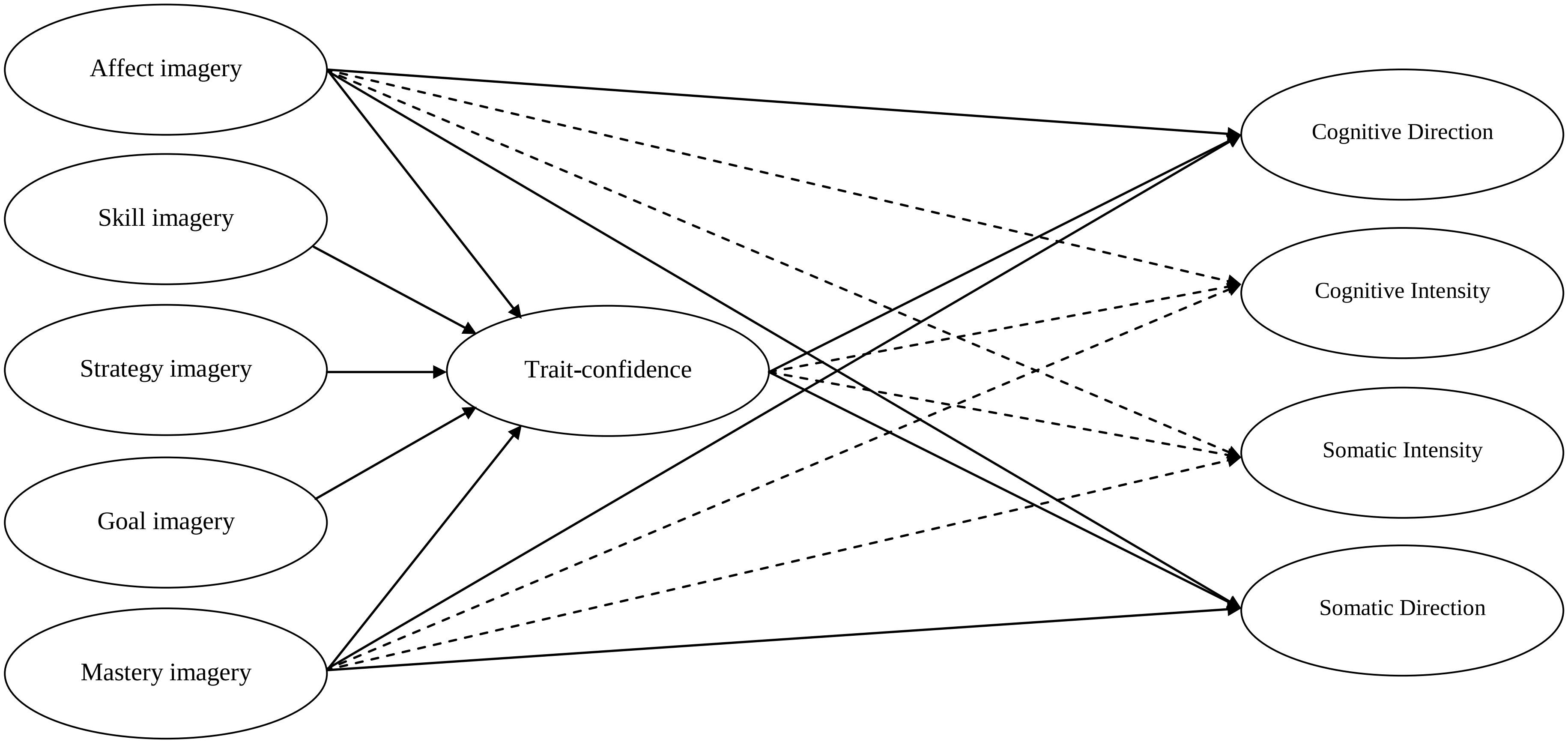

Figure 1. Hypothesized model. For visual simplicity, variances are not presented but are hypothesized as significant. *Note:* Full lines are positive predictions and dashed lines are negative predictions.

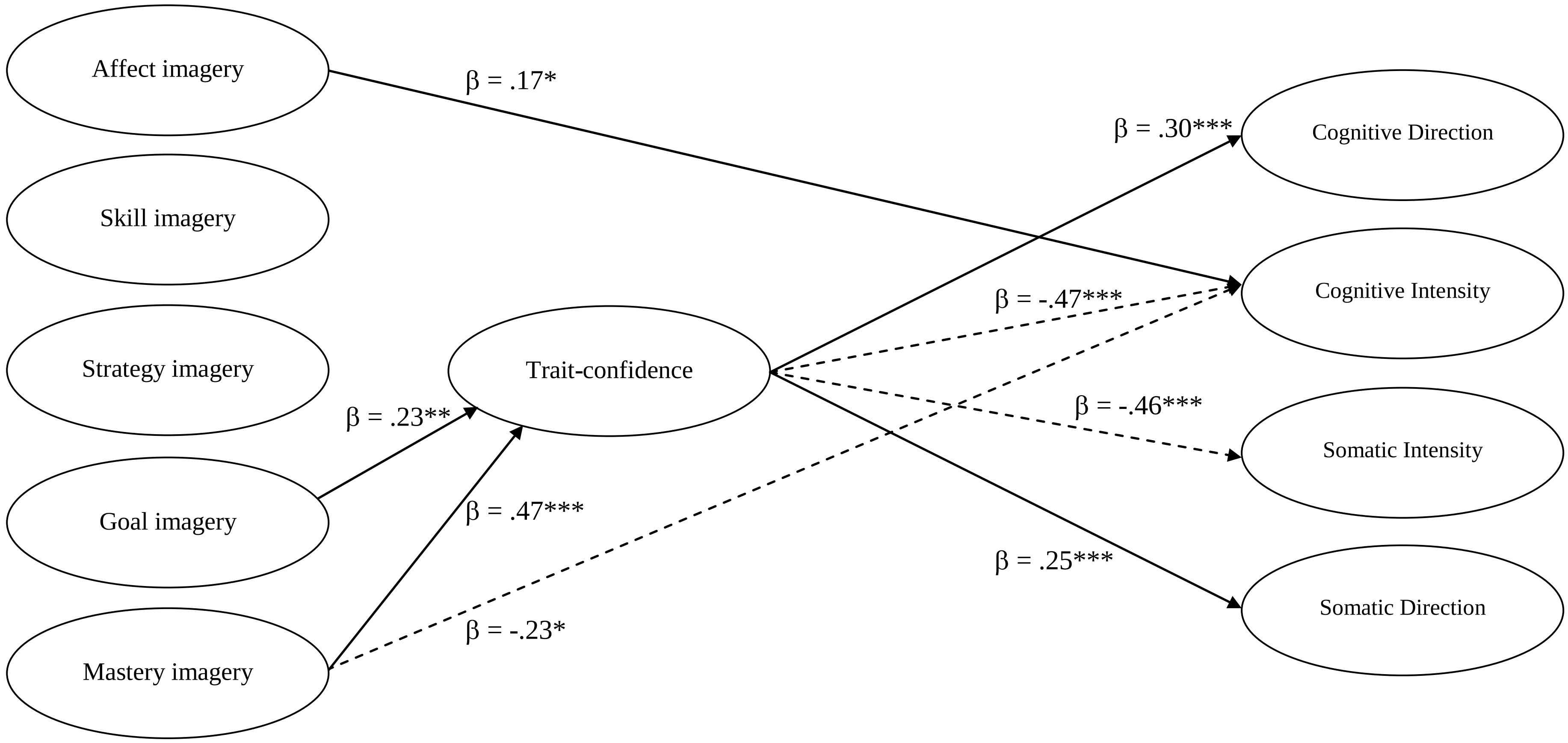

Figure 2. Final model predicting trait-confidence, and cognitive and somatic anxiety intensity and direction. *Note:* All coefficients are standardized. * $p < .05$, ** $p < .01$, *** $p < .001$. Full lines are positive predictions and dashed lines are negative predictions. For visual simplicity, variances are not presented but were all significant ($p < .01$).